

AMENDMENTS TO THE CLAIMS:

The following listing of claims supersedes all prior versions and listings of claims in this application:

1. (Currently Amended) Crystal oriented ceramics composed of a polycrystalline substance of an isotropic perovskite compound represented by the general formula:



(wherein, ~~$0 < x \leq 0.2$, $0 < y \leq 1$, $0 < z \leq 0.4$, $0 < w \leq 0.2$~~

$0.02 \leq x \leq 0.08$, $0 < y \leq 1$, $0 < z \leq 0.14$, $0.02 \leq w \leq 0.1$), and a specific crystal plane of each crystal grain that composes said polycrystalline substance is oriented; and

wherein, there is a temperature range where the amount of fluctuation of $E_{33\text{large}}$ as measured according to formula A1 under electric field driving conditions having a constant amplitude of an electric field strength of 100 V/mm over an arbitrary temperature range of 100°C or more equal to or lower than the Curie temperature is within $\pm 15\%$; wherein, the amount of polarization is measured from a polarization-electric field hysteresis loop in the case of driving by applying a high voltage, and $E_{33\text{large}}$ is the dielectric constant in a strong electric field based on this (dynamic dielectric constant), and is defined by equation A1:

$$E_{33\text{large}} = P_{\text{max}} / (EF_{\text{max}} \times \epsilon_0) = (Q_{\text{max}} / A) / (V / L) \times \epsilon_0 \quad \text{A1}$$

wherein, here, P_{\max} represents the maximum charge density (C/m^2), EF_{\max} represents the maximum electric field strength (V/m), Q_{\max} represents the maximum charge (C), A represents the electrode surface area (m^2), ϵ_0 represents the dielectric constant in a vacuum (F/m), L represents the original length prior to applying a voltage (m), and V represents the applied voltage (V).

2. (Previously Presented) Crystal oriented ceramics according to claim 1 wherein, the specific crystal plane is the pseudo-cubic {100} plane and its degree of orientation as determined according to the Lotgering method is 30% or more.

3. (Original) Crystal oriented ceramics according to claim 1 wherein, the piezoelectric d_{31} constant at room temperature is 1.1 times or more that of a non-oriented sintered compact having the same composition.

4. (Original) Crystal oriented ceramics according to claim 1 wherein, the electromechanical coupling coefficient k_p at room temperature is 1.1 times or more that of a non-oriented sintered compact having the same composition.

5. (Original) Crystal oriented ceramics according to claim 1 wherein, the piezoelectric g_{31} constant at room temperature is 1.1 times or more that of a non-oriented sintered compact having the same composition.

6. (Original) Crystal oriented ceramics according to claim 1 wherein, the rate of improvement resulting from orientation in displacement generated under electric field driving conditions having a constant amplitude of an electric field strength of 100 V/mm or more at a predetermined temperature equal to or below the Curie temperature is 1.1 times.

7. (Original) Crystal oriented ceramics according to claim 1 wherein, there is a temperature range where the amount of fluctuation of displacement under electric field driving conditions having a constant amplitude of an electric field strength of 100 V/mm or more over an arbitrary temperature range of 100°C or more equal to or lower than the Curie temperature is within $\pm 20\%$.

8. Cancelled

9. (Original) Crystal oriented ceramics according to claim 1 wherein, there is a temperature range where the amount of fluctuation of the value defined by

$D_{33\text{large}}/(E_{33\text{large}})^{1/2}$ under electric field driving conditions having a constant amplitude over an arbitrary temperature range of 100°C or more equal to or lower than the Curie temperature is within $\pm 10\%$; wherein, $D_{33\text{large}}$ is the displacement generated in a direction parallel to the direction in which voltage is applied in the case of applying a high voltage, and is defined by equation A2:

$$D_{33\text{large}} = S_{\text{max}}/EF_{\text{max}} = (\Delta L/L)/(V/L) \quad \text{A2}$$

(wherein, S_{max} represents the maximum strain, ΔL represents the displacement induced by the electric field (m), L represents the original length prior to applying a voltage (m), and V represents the applied voltage (V)).

10. (Previously Presented) Crystal oriented ceramics according to claim 1 wherein, there is a temperature range where the amount of fluctuation of the value defined by $D_{33\text{large}}/E_{33\text{large}}$ under electric field driving conditions having a constant amplitude over an arbitrary temperature range of 100°C or more equal to or lower than the Curie temperature is within $\pm 8\%$.

11. (Original) Crystal oriented ceramics according to claim 1 wherein, there is a temperature range where the amount of fluctuation of displacement generated under constant energy driving conditions over an arbitrary temperature range of 100°C or more equal to or lower than the Curie temperature is within $\pm 10\%$.

12. (Previously Presented) Crystal oriented ceramics according to claim 1 wherein, there is a temperature range where the amount of fluctuation of displacement generated under constant charge driving conditions over an arbitrary temperature range of 100°C or more equal to or lower than the Curie temperature is within $\pm 8\%$.

13. (Previously Presented) Crystal oriented ceramics according to claim 1 wherein, a crystal system of said crystal grain is a tetragonal system over an arbitrary temperature range of 100°C or more equal to or lower than the Curie temperature.

14. (Previously Presented) A production method of crystal oriented ceramics comprising:

a mixing step in which an anisotropic shaped powder of plate-like crystal material, for which a crystal growth plane has lattice coherency with a specific crystal plane, is mixed with reaction material that can react therewith to form an isotropic perovskite compound of claim 1;

a molding step in which the mixture obtained in the mixing step is molded so that the specific anisotropic shaped powder crystal planes are oriented; and,

a heat treatment step in which the molded product obtained in the molding step is heated to cause a reaction between the anisotropic shaped powder and the reaction material to form a crystal oriented ceramic material as in claim 1.

15. (Previously Presented) A crystal oriented ceramics production method according to claim 14 wherein, the anisotropic shaped powder is a plate-like powder having the pseudo-cubic {100} plane for its growth plane and is represented by the following general formula:



(wherein, x, y, z and w are $0 < x \leq 0.2$, $0 < y \leq 1$, $0 < z \leq 0.4$, $0 < w \leq 0.2$, respectively).

16. (Original) A piezoelectric element comprised of a piezoelectric material composed of crystal oriented ceramics according to claim 1.

17. (Original) A dielectric element comprised of a dielectric material composed of crystal oriented ceramics according to claim 1.

18-19. Cancelled

20. (New) Crystal oriented ceramics according to claim 1 wherein, $0.4 \leq y \leq 0.6$.